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A Comparison of Production Estimates
for
The Soviet Aluminum Industry

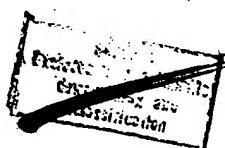
1. The opportunity to compare notes and to resolve the differences in our estimates of Soviet aluminum output is indeed a welcome one. Your memorandum of 27 December is an impressive analysis of the variance in our papers and we appreciate the great effort which went into its preparation. The following paragraphs describe the methods and reasoning that underly our estimate and we welcome your further comments.

2. As you may be aware, we formerly used a methodology similar to yours for estimating Soviet output of aluminum. This methodology consisted of the extrapolation of the USSR's 1937 production on the basis of announcements in the Soviet press on plan fulfillment and percentage increases in output. An alternative methodological process was sought because small variances and discrepancies in the announcements of the Soviet press led to considerable confusion and eventually to a significant overestimation of the production capability of the USSR during the years of the Seven Year Plan. A critical review that we made of our estimating process in 1964 indicated that our estimate was too high and led us to develop a new technique.

3. The estimating technique we now use is based on the size of cell buildings, the number of cells in each building, and the annual capacity of each cell. The following is the basic information required for assessing our methodology.

a. Electrolytic Cells — According to the Ekonomicheeskaya Entsiklopediya Pravvylezhest' Struktel'stva, Volume 51, A-N, 1962, p. 66, two basic types of electrolytic cells are used in the USSR. The cells in the newest plants are reported to produce 260-340 tons of aluminum per year, while the cells in older plants are reported to produce 130-180 tons annually. The newest cells operate at 130-150 thousand amperes and achieve high operating efficiencies. The older cells are believed to operate at 50-80 thousand amperes. While the new, more powerful cells produce significantly more aluminum than the older cells, they are also considerably larger. Thus, the advantage of the larger cell lies not so much in increasing output per unit of shape area, but rather in reducing costs per unit of output. Thus, by Soviet computation, the annual output in tons per square meter of pot room in the older plants is 1.6-1.7 and increases only to 1.9-2.0 in the newest plants.

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b. Cell Buildings — The newest Soviet electrolytic cell buildings are 600 meters long and 30 meters wide, within which are located two rows of electrolytic cells. Pot rooms of this type are being erected at the Bratsk and Krasnoyarsk Plants, and in the new sections of some older plants. Before this size became standard, the typical Soviet cell building was 550 meters in length and 27 meters wide, with two rows of cells. This was the basic design of the first pot rooms at Irkutsk and Volgograd and was typical of most built during the 1959-65 plan period. Still earlier the Soviets built cell buildings of two basic designs — one of rather short length but wide enough to accommodate 4 rows of cells and a longer, narrower type with only two rows of cells. Thus, the plant at Zaporozhe has 8 cell buildings, each of which is 160 meters long and 40 meters wide and contains 4 rows of cells. A plant of about the same vintage at Kanaker however, has buildings 350 meters long and 27 meters wide and only two rows of cells. The factors which favored one type over the other are not known but the topography and the shape of available space at each plant may be significant. The following table sets forth the estimated size and type of cell buildings at each plant, the type of cells used, and the estimated capacity and production for 1965.*

4. The data for the table has been derived from various sources, primarily from the Soviet press. The press is a particularly important source of data on the size of cell buildings at most Soviet plants. For some of the older plants, for which the data were not available, various other estimating means have been adopted with considerable success, and it is believed that the range of error regarding the number and size of cell buildings is quite small.

5. By multiplying the productivity per cell (based on data in the Soviet industrial encyclopedia) by the number of cells in each building, it is possible to determine rather accurately the capacity of any given plant. The independent verifications which we have been able to develop indicate that our estimates are quite accurate. Moreover, our estimate of total annual production based on the summation of individual plant production in the past two years and for the Seven Year Plan has shown exactly the same percentage increase as those announced by the Soviet press. In addition, the announced increase for 1966 is also in precise accord with what we had estimated on the basis of the planned introduction of new pot rooms.

* Table follows on page 3.

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Data on Soviet Electrolytic Plants - End of 1965

<u>Plant</u>	<u>Number of Buildings</u>	<u>Size of Buildings</u>	<u>Cell Size</u>	<u>Our m.t.</u>	<u>Your m.t.</u>	<u>Estimated Capacity (1965)</u>	<u>Estimated Output m.t.</u>	<u>Remarks</u>
Kandalaksha	4	350 x 33	80 KA	75,000	33,000		75,000	
Nadyoitsey	4	350 x 27	80 KA	65,000	40,000		60,000	
Volkhov	5	150 x 23	80 KA	20,000	26,000		20,000	
Dnepr	8	170 x 40	80 KA	90,000	100,000		90,000	
Bogoslavsky	6	2-250 x 30 4-350 x 27	80 KA	100,000	110,000		100,000	Has 4 rows of cells per pot room
Urals	8	170 x 40	80 KA	90,000	175,000		90,000	Has 4 rows of cells per pot room
Volgograd	6	4-550 x 27 2-600 x 30	130 KA	160,000	144,000		105,000	Shortage of alumina plagued this plant in 1965
Novokuznetsk	10	2-350 x 27 4-400 x 27 2-550 x 27 2-600 x 30	80 KA 130 KA	230,000	150,000		230,000	Pot rooms #11 and #12 have now been completed and introduced into operation, bringing capacity to 290,000 tons

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Data on Soviet Electrolytic Plants - End of 1965 (continued)

Plant	Number of Buildings	Size of Buildings	Cell Size	Our m.t.	Your m.t.	Estimated Capacity m.t.	Estimated Output m.t. (1965)	Remarks
Umgait	4	350 x 27	80 KA	60,000	60,000	60,000	60,000	
Kanaker	2	350 x 27	80 KA	35,000	65,000	35,000	35,000	
Irkutsk	5	4-550 x-27 1-600 x 30	130 KA	125,000	250,000	110,000	110,000	Reportedly added capacity to one pot room.
Krasnoyarsk	2	600 x 30	150 KA	60,000	110,000	50,000	50,000	5th cell building entered. operation in September 1965. Second added April 1965, another added January 1966.
TOTAL				1,110,000		1,025,000		

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6. Admittedly, some error in estimates of output is unavoidable because of the many variable factors involved in aluminum production. Consequently, we believe that our estimates are incompatible with yours only in respect to the following plants: Irkutsk, Yerevan, Kandalaksha, Krasnoyarsk, Novokuznetsk, and Kamensk-Uralsk. For these plants a more detailed discussion of our methodology follows.

7. Irkutsk — Our 1965 estimate of output is based on calculations for the four pot rooms which operated during the entire year and the fifth which entered into production on the 19th of August. The first four pot rooms are each 350 meters long, 27 meters wide and contain 82 cells which operate at 130,000 amperes. Each pot room of this size (82 cells x 300 tons) has a capacity of about 25,000 tons annually. The fifth pot room is estimated to have a capacity of 30,000 tons annually because of its greater length and additional cells (600 meters long and contains 90 cells). For the four months of 1965 which it operated, we estimated that it produced 10,000 tons. Thus, our estimated output for Irkutsk in 1965 is 110,000 tons.

8. The factor leading to your higher estimate of output per pot room at Irkutsk apparently is the statement quoted from GORBA that by 1970, Irkutsk would exceed the 1962 output of Italy and France. We believe that the statement must have resulted from an erroneous translation or from misinformation because the capacity of the pot rooms as calculated from Soviet data is only 25,000 tons. Moreover, if one accepts your estimate of the capacity of the very modern Bratsk plant (900,000 tons per year) to be correct, each of its 24 pot rooms would produce no more than 37,500 tons, considerably less than you estimate for Irkutsk. We believe that Irkutsk will have an eventual production of about 220,000 tons — four 25,000 ton pot rooms and four 30,000 ton pot rooms.

9. Incidentally, our estimate for Bratsk is not greatly different from yours. We believe that at the time construction is completed the pot rooms at Bratsk will have a production of 30,000 tons each and a total output of 720,000 tons. Later improvements in efficiency may increase this by 10 percent or more.

10. Kanaker — According to the most recent data available to us, the Kanaker plant had only two pot rooms, of the older standard size (about 350 meters long and 27 meters wide). According to output data for pot rooms of this size, it can be calculated that each has a capacity of 15,000 tons annually. Evidence concerning the relatively high efficiency of the plant and the probable expansion of one pot room led us to allow an additional potential of 5,000 tons. The Sungait plant which you have credited with output of a size comparable to Kanaker, has four pot rooms of about the same size and thus almost certainly a capacity of double that of Kanaker.

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11. Kandalaksha — The Kandalaksha plant has four pot rooms of a size somewhat in excess of those at Nadvoitsy, Kenaker, and Sungait and thus has a somewhat greater output. It seems quite clear that this plant exceeds your estimate of 33,000 tons annually.

12. Novokuznetsk — During 1965, Novokuznetsk had 10 pot rooms operating. Based on calculations using the known operating parameters, the pot rooms had capacities from the smallest to the largest of 15,000; 20,000; 25,000; and 30,000 tons respectively. We estimate that this plant had a capacity of 220,000 tons in 1965. During 1965 however, certain operating efficiencies were achieved which permitted output to reach an estimated 230,000 tons. Since that time, two new pot rooms, estimated to have a capacity of 30,000 tons each, have been added increasing this plant's capacity to 270,000 tons.

13. Kamenek-Uralsk — The data that we have available indicates this plant is similar to the plant at Zaporojche. According to reliable data, the similar plant at Zaporojche in 1965 produced 90,000 tons. Therefore, we assigned a like output to Kamenek-Uralsk. We are confident that the information stating that these plants are of similar size is accurate and that 90,000 tons is very close to actual production.

14. Krasnoyarsk — This plant had one pot room operating during the entire year, and another entered operation in April 1965. Both buildings are reported to be 600 meters long and 30 meters wide and contain 90 cells each. Based on this data, an output of 30,000 tons per pot room can be calculated. By prorating 2/3rds of a year's production at the new pot room and giving full allowance for the other, Krasnoyarsk produced an estimated 50,000 tons. An additional pot room came into operation in the very first part of January 1966 and, with another which entered production in September, increased the production for 1966 to 100,000 tons.

15. Our information regarding Pavlodar, Beger, and Myski is identical to yours. The plants at Pavlodar and Beger will almost certainly not play an important role in Soviet production through 1970. We believe that a plant will probably never be built at Myski.

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16. Your conclusion on p. 15 that the commissioning of Irkutsk and Krasnoyarsk is not reflected in our estimates for 1962 and 1964 indicates a misunderstanding of our data. As mentioned previously, we prorated new capacity for the part of the year during which it operated, and, allowances were made for difficulties in achieving high operating parameters for new equipment. For example, a new potline was introduced at Irkutsk in November 1962 for which we allowed an increase in output of only 4 thousand tons for that year. However, the full 25,000 tons of output from this pot room was added to the plant's output for 1963. Thus, our estimates reflect the impact of new plant in the time period when the equipment made a significant contribution to output. Of course, the fact that we rate the pot lines at only half the capacity that you give them also accounts for the much smaller impact of these new plants in our estimates.

17. Since publication of our study in January 1967, we have not predicted Soviet output for 1970. However, shortages of raw materials are expected to persist and the end use of aluminum is expected to gain slowly in the USSR. Thus, we feel that there is some question whether the Soviets will continue with plans to double output.

18. We agree that estimating Soviet alumina production is much more difficult. In most cases, we have followed similar reasoning and reached similar conclusions. We do have somewhat greater expectation from Achinsk where, some data indicate, cement production will be 8-9 million tons, which in turn implies an alumina output of 600-900 thousand tons. For Pavlodar we have made a rough estimate that each section produces 170,000 tons. Thus far, two sections have been completed and the third will be finished in 1969. Plans to construct another 3 sections have been reported recently.